Effect of brief safer-sex counseling by medical providers to HIV-1 seropositive patients: a multi-clinic assessment

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Objective: To test the efficacy of brief, safer-sex counseling by medical providers of HIV-positive patients during medical visits.

Setting: Six HIV clinics in California.

Design: Clinics were randomized to intervention arms evaluated with cohorts of randomly selected patients measured before and after the intervention.

Participants: Five-hundred and eighty-five HIV-positive persons, sexually active prior to enrollment.

Interventions: Prevention counseling from medical providers supplemented with written information. Two clinics used a gain-framed approach (positive consequences of safer-sex), two used a loss-frame approach (negative consequences of unsafe sex), and two were attention-control clinics (medication adherence). Interventions were given to all patients who attended the clinics.

Outcome measure: Self-reported unprotected anal or vaginal intercourse (UAV).

Results: Among participants who had two or more sex partners at baseline, UAV was reduced 38% ($P < 0.001$) among those who received the loss-frame intervention. UAV at follow-up was significantly lower in the loss-frame arm [odds ratio (OR), 0.42; 95% confidence interval (CI), 0.19–0.91; $P = 0.03$] compared with the control arm. Using generalized estimating equations (GEE) to adjust for clustering did not change the conclusions (OR, 0.34; 95% CI, 0.24–0.49; $P = 0.0001$). Similar results were obtained in participants with casual partners at baseline. No effects were seen in participants with only one partner or only a main partner at baseline. No significant changes were seen in the gain-frame arm.

Conclusions: Brief provider counseling emphasizing the negative consequences of unsafe sex can reduce HIV transmission behaviors in HIV-positive patients presenting with risky behavioral profiles.

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Introduction

A majority of persons diagnosed with HIV remain sexually active [1–6]. Many engage in safer sex, but some engage in unprotected sexual intercourse potentially contributing to the spread of the virus. Reports of the prevalence of unprotected anal intercourse ranges from 10% to 46% of HIV-positive men who have sex with men (MSM) [4,5,7–10]. The prevalence of unprotected vaginal intercourse in HIV-positive women ranges from 37% to 52% [11–13].

Most HIV prevention programs have been directed at HIV-negative persons [14–17]. Limited research has addressed reducing high-risk sexual behavior in HIV-infected persons despite their potentially important role in HIV transmission and their accessibility during medical care [18–19]. Counseling at the time of HIV testing sometimes does not address risk-reduction [20], is usually administered in a single short session at a time of high emotional distress and by a counselor without a sustained relationship with the seropositive person. Studies have shown that primary health care providers can help patients change risky health behaviors (e.g., smoking, diet) [21–23]. HIV care providers may be similarly successful in helping their HIV patients reduce risky sexual behaviors.

Information that instills recognition of risk and motivation to reduce risk can be conveyed in a way that emphasizes the benefits or positive consequences of protective behavior (gain-frame) or the risks or negative consequences of risky behavior (loss-frame) [24–26]. Although both can be delivered in a caring and concerned manner by the provider, these two frames may have a different impact depending upon the health care issue being addressed [24–27]. Loss-framed messages have done better than gain-framed messages in promoting detection behaviors (e.g., breast self-examination [25]), whereas gain-frame has done better than loss-frame in promoting prevention behaviors (e.g., use of sunscreen [27]). Prior studies, however, were not conducted in diseased persons who may be particularly receptive to messages about potential health risks. Also, framing information has not been examined in promoting safer-sex in HIV-positive persons and it is not clear which frame may be most efficacious.

We examined the efficacy of message framing in the context of a brief provider-administered, safer-sex intervention for HIV-positive persons in care. Messages were presented to patients in written form and by provider counseling during the patient's clinic visits.

Methods

Design

This was a controlled intervention trial performed at six large HIV clinics in California. Two clinics implemented gain-framed counseling (emphasizing the positive consequence of practicing safer sex), two clinics implemented loss-framed counseling (emphasizing the negative consequences of unsafe sex), and two clinics implemented an intervention to enhance adherence to antiretroviral therapy (ART) (attention-control). A measurement cohort was randomly recruited at each clinic during 1998–1999 and baseline data were collected. Providers and staff were trained to deliver the counseling intervention randomly assigned to their clinic. The intervention was delivered to all patients attending the clinic during a 10–11-month period during 1999–2000. The cohort was reassessed during a period up to 7 months after the intervention ended. An incentive was paid at each interview.

Procedures for the protection of human subjects were approved by the Institutional Review Boards overseeing each clinic and by the Institutional Review Board at the Centers for Disease Control and Prevention. A Certificate of Confidentiality was issued to all sites by the National Institute of Mental Health.

Participant selection criteria and recruitment

Trained project interviewers implemented standardized recruitment procedures. Criteria for inclusion in the measurement cohort included: being aware of one's HIV-positive status and sexually active (mutual masturbation, oral, anal, or vaginal sex) during 3 months prior to participation, age 18 years and older, fluent in English or Spanish, able to provide written informed consent, and intent to obtain care at the clinic for the next year. Enrollment continued until approximately 150 cohort patients were recruited at each clinic.

A total of 2027 patients were approached to determine eligibility. Nine percent ($n = 187$) refused to be screened and 562 were ineligible [not sexually active in the past 3 months (88.1%), not receiving regular care at the clinic (6.4%), diagnosed less than 3 months prior (6.2%), language or age exclusion (0.9%)]. Of the 1278 who were eligible, 886 (69%) enrolled and 392 were not recruited (46.7% lacked time, 10.0% refused, 39.0% no reason, and 4.3% other reasons). Each clinic sample closely approximated the composition of the clinic population in terms of gender and ethnicity.

The interviewer administered the questionnaire in a private room. To assure confidentiality and improve candor, the patient could record responses to the sexual

behavior questions on the questionnaire rather than answering aloud. The medical providers were not involved in collecting the data and were not aware of which patients were in the measurement cohort. The interviewer abstracted CD4 cell count and viral load from the patient's medical record. A randomly generated number was used to link waves and sources of data for each participant. At follow-up, the interviewer made at least 10 attempts to contact all patients who participated in the baseline survey.

Self-report measures

Measures focused on partner-specific sexual behaviors during the 3 months prior to the interview. Participants reported all sexual behaviors with up to two most recent partners in each of six partner categories: main partners, casual partners, and exchange partners by gender of partners. Participants used a checklist to report anal, vaginal, and oral sex with or without using a condom.

Intervention

A 4-hour training program was delivered to all clinic staff and consisted of: (i) background data and rationale; (ii) behavior change theories; (iii) communication skill building; (iv) conducting a brief counseling session and communicating gain- or loss-framed messages; (v) role play of safer-sex counseling; and (vi) program implementation and referrals. A booster training session was given 1 month after the start of the intervention.

The intervention ('Partnership for Health') emphasized the importance of a patient–provider team approach to help patients stay as healthy as possible. Providers discussed the partnership concept with patients and provided gain- or loss-framed messages (e.g., Gain: 'We encourage you to make choices that protect yourself and others. Safer sex protects you from other sexually transmitted diseases and from other strains of HIV;' Loss: 'We encourage you to make choices that do not put yourself or others at risk. Unsafe sex may expose you to other sexually transmitted diseases and other strains of HIV'). Providers also discussed safer-sex goals and risk-reduction behaviors. The counseling was brief (3–5 min) but was given at all visits except for those dealing with acute illness. Providers were asked to document counseling (not patient sexual behavior) in the patient's chart. The only aspect that systematically differed between clinics was the framing (gain versus loss) of the prevention messages and counseling delivered to patients. Similar information was included in printed material (e.g., a brochure given to all patients explained the partnership concept, and had a series of framed messages and risk-reduction strategies).

Attention-control intervention

The attention-control protocol focused on adherence to ART. The procedures and training for this protocol were similar to those used in the safer-sex interventions. It used the same types of counseling and materials as well as a tailored medication schedule.

Analysis

The primary outcome variable was self-reported unprotected insertive anal, receptive anal, or vaginal intercourse (UAV) with any partner(s) during the previous 3 months. A dichotomous score at baseline and follow-up was used (UAV with at least one partner versus no UAV with any partner). Logistic regression assessed the extent to which the gain- and loss-framed interventions (relative to the attention-control group) reduced UAV at follow-up after statistically controlling for covariates.

The arms differed significantly ($P < 0.05$) by ethnicity, income, employment, education, gender of sex partners, prevalence of UAV and number of sex partners in the past 3 months. The arms did not differ significantly on viral load, CD4 cell count, being on ART, years since testing HIV-positive, gender or age (Table 1). We included as covariates not only those variables that differed significantly by arm, but also those that were non-significant, thus controlling for potentially small confounding effects (see note at bottom of Tables 3 and 4).

Because randomization occurred at the clinic level, we repeated the analysis applying a generalized estimating equations (GEE) model to the data (PROC GENMOD SAS software, version 8.1). GEE adjusts for clustering of patients by clinic with simultaneous adjustment for patient covariates. We specified an exchangeable correlation matrix to indicate that each pair of patients in the same clinic was assumed to be correlated and the correlation remains the same for every pair of patients. Because the outcome was dichotomous, we specified the logit-link function.

We decided, *a priori*, to examine the intervention effects separately for those who had only one sex partner at baseline (lower-risk) and for those with two or more partners at baseline (higher-risk) to determine whether the interventions changed the behavior of persons most at risk for transmitting HIV.

Analyses were conducted to determine whether loss to follow-up of high-risk participants (i.e., those who engaged in UAV at baseline) was comparable across the three intervention arms. Analyses were also conducted to adjust for attrition. Those lost to follow-up were assigned a follow-up UAV score that was the same as their baseline score and analyses were repeated**.** This approach (last value carried forward), is a conservative imputation that assumes no intervention effect for those lost to follow-up [28,29].

Table 1. Comparisons on demographic, disease and risk characteristics at baseline by intervention group (n = 585).

	Control (%) (n = 196)	Gain-frame (%) (n = 175)	Loss-frame (%) (n = 214)	χ^2 (*P*)
Gender				
Female	13.8	14.9	13.1	0.25 (0.88)
Male	86.2	85.1	86.9	
Sexual orientation				
MSM	74.5	65.1	80.4	17.7 (0.007)
MSW	11.7	20.0	6.5	
WSM	12.2	13.7	11.7	
WSW	1.5	1.1	1.4	
Ethnicity				
African-American	8.1	21.1	17.8	26.3 (< 0.001)
Hispanic	38.8	44.0	30.4	
White	48.0	28.6	45.8	
Other	5.1	6.3	6.1	
Annual household income ($US)				
⩽ 14 999	54.4	78.3	64.6	23.2 (< 0.001)
⩾ 15 000	45.6	21.7	35.4	
Employment				
Full	35.2	17.7	17.7	23.1 (<0.001)
Part	18.9	19.4	22.0	
Not working	45.9	62.9	60.3	
Education				
Less than high school	21.9	34.3	15.4	27.3 (0.001)
High school graduate	20.9	26.3	21.0	
More than high school	57.1	39.4	63.6	
CD4 cell count ($\times 10^6$/l)[a]				
< 200	18.2	21.3	16.0	1.8 (0.41)
⩾ 200	81.8	78.7	84.0	
Viral load (copies/ml)				
< 500	47.5	47.4	52.8	1.6 (0.46)
⩾ 500	52.6	52.6	47.2	
On ART				
Not on ART	17.4	15.4	20.1	1.47 (0.48)
Yes on ART	82.7	84.6	79.9	
UAV				
No	68.9	71.1	58.8	7.63 (0.02)
Yes	31.1	28.9	41.2	
Number of sex partners				
One	67.4	74.9	57.0	13.9 (< 0.001)
Two or more	32.7	25.1	43.0	
Mean age (years)	39.1	38.6	37.8	$F = 1.54$ ($P = 0.21$)
Mean years since HIV-positive diagnosis	6.6	6.5	6.1	$F = 0.63$ ($P = 0.53$)

[a]CD4 cell count data is missing six values. MSM, Men who have sex with men; MSW, men who have sex with women; WSM, women who have sex with men; WSW, women who have sex with women; ART, antiretroviral therapy.

Results

We completed follow-up on 585 participants (66% of baseline sample). Of the 301 participants lost to follow-up, 114 (38%) could not be contacted, 58 (19%) were not seen at the clinic in 6 months, 43 (14%) moved, 27 (9%) died, 17 (6%) were incarcerated, 29 (9%) did not appear or refused, and 13 (5%) gave health reasons.

Those lost were similar to those interviewed at time 2 by gender, ethnicity, income, education, age, years since testing HIV-positive, CD4 cell count, number of sex partners in the past 3 months and past year, and prevalence of UAV. Those lost had a higher viral load, were less likely to be on ART, were more likely to be MSW, and were more likely to be at gain-frame clinics (due to the difficulty of following patients at one gain-frame clinic that served more transient patients). Most importantly, the prevalence of UAV at baseline in the loss (41%), gain (29%), and attention-control (31%) arms among the 585 longitudinal participants was comparable to the prevalence of UAV at baseline among the initial sample of 886 (44%, 31%, and 29%, respectively). This attrition analysis was repeated separately for participants who reported two or more sex partners at baseline and for participants who reported only one partner. Again, there was no evidence of differential loss in the three intervention arms.

On the follow-up survey, participants indicated how often their primary care providers at the clinic talked with them about safer-sex. After statistically controlling for responses to the same item at baseline, participants in the gain-framed [odds ratio (OR), 3.69; 95%

confidence interval (CI), 2.35–5.78; $P < 0.01$] and loss-framed (OR, 2.33; 95% CI, 1.46–3.73; $P < 0.05$) arms were more likely than participants in the attention-control arm to report that physicians talked with them about safer-sex at half or more of their clinic visits. The same pattern of results was obtained for safer-sex communication from a nurse, nurse practitioner, or physician assistant (assessed as a group). These findings indicate that the safer-sex counseling protocol lead to more frequent discussion of safer sex at gain- and loss-framed clinics in comparison to control clinics.

Table 2 displays the prevalence of UAV at baseline and follow-up, stratified by number of sex partners at baseline and by intervention arm. Among those with one partner at baseline, no significant change in UAV from baseline to follow-up was found in any of the intervention arms. Among those with two or more partners at baseline, UAV decreased 4% (Z, 0.23; $P = 0.82$) in the control arm, and increased a non-significant 10% (Z, 0.47; $P = 0.64$) in the gain-frame arm which may reflect nothing more than measurement error. In the loss-frame arm, however, UAV at follow-up was reduced by 38% from 53% to 33% (1–33/53; test of dependent proportions: Z, 3.13; $P < 0.001$). The reduction was comparable for sex partners reported to be HIV-negative/unknown (35% lower) and sex partners reported to be HIV-positive (32% lower). Analyses conducted separately for the two loss-frame clinics demonstrated that UAV was reduced at each clinic (46% and 30%). In summary, patients with one sexual partner at baseline were unaffected by the interventions, and the loss-frame intervention reduced UAV in patients with multiple sex partners at baseline.

Table 3 displays the logistic regression analysis of UAV at follow-up, comparing gain- and loss-frame arms against the control arm. Those with one partner at baseline were unaffected by the interventions. For those with two or more partners, UAV at follow-up was significantly reduced in the loss-frame arm compared to the attention-control arm (OR, 0.42; 95% CI, 0.21–0.83; $P = 0.01$) after controlling for UAV at baseline. The effect remained significant (OR, 0.42; 95% CI, 0.19–0.91; $P = 0.03$) in a multivariate model that controlled for all of the covariates. There was no significant effect for participants with two or more partners in the gain-frame arm.

Table 3. Logistic regression analysis of unprotected anal or vaginal intercourse (UAV) at time 2 by number of partners.

	Odds ratio	95% Confidence interval	*P*
Overall[a]			
Attention-control	1.0		
Gain-frame	0.96	0.60–1.54	0.88
Loss-frame	0.78	0.50–1.22	0.28
One baseline sex partner[a]			
Attention-control	1.0		
Gain-frame	1.18	0.65–2.17	0.59
Loss-frame	1.20	0.65–2.22	0.56
Two or more baseline sex partners[a]			
Attention-control	1.0		
Gain-frame	0.81	0.36–1.82	0.61
Loss-frame	0.42	0.21–0.83	0.01
Two or more baseline sex partners[b]			
Attention-control	1.0		
Gain-frame	1.37	0.50–3.74	0.54
Loss-frame	0.42	0.19–0.91	0.03

[a]Statistically controlling for UAV at baseline. [b]Statistically controlling for the following variables at baseline: UAV, age, ethnicity, education, gender of sex partners, income, employment, years since testing HIV-positive, CD4 cell count, viral load, and being under treatment with antiretroviral therapy.

At baseline, 45% of the MSM reported having two or more partners as compared to only 4% of heterosexuals (six individuals). We repeated the fully controlled analysis on MSM only and the results for the loss-frame effect were similar (OR, 0.43; 95% CI, 0.19–0.94; $P = 0.04$).

We re-examined the intervention for participants who had any casual/exchange partners at baseline (including those with one or two partners). A larger group of participants (n = 279) was included in this analysis because many of those with one partner considered that partner to be casual. UAV in the gain-frame arm was not significantly reduced (OR, 0.78; 95% CI,

Table 2. Percent unprotected anal or vaginal Intercourse (UAV) at baseline (time 1) and follow-up (time 2), by intervention arm and number of sex partners at baseline.

	Attention-control (n = 190)	Gain-frame (n = 172)[a]	Loss-frame (n = 210)[a]
One baseline sex partner			
Time 1	20% (25/127)	26% (33/128)	32% (38/118)
Time 2	21% (27/127)	26% (33/128)	28% (33/118)
Two or more baseline sex partners			
Time 1	54% (34/63)	39%(17/44)	53% (49/92)
Time 2	52% (33/63)	43% (19/44)	33% (30/92)

[a]The sample sizes of the intervention arms does not equal 585 due to deletion of homosexual women and a few cases of missing data.

0.41–1.52; $P = 0.47$), whereas UAV in the loss-frame arm was significantly reduced (OR, 0.51; 95% CI, 0.27–0.96; $P = 0.04$). There was no effect for those with only main partners at baseline in the gain-frame arm (OR, 1.27; 95% CI, 0.63–2.54; $P = 0.50$) or the loss-frame arm (OR, 1.31; 95% CI, 0.67–2.57; $P = 0.44$).

We repeated the analysis using GEE. Neither frame affected the prevalence of UAV for those with one partner. For those with two or more partners a significant reduction occurred in the loss-frame arm (OR, 0.34; 95% CI, 0.24–0.49; $P = 0.0001$) but no effect for the gain-frame arm (see Table 4). We also re-examined the intervention effects for those with casual/exchange partners using GEE. UAV was not changed in the gain-frame arm (OR, 1.21; 95% CI, 0.72–2.02; $P = 0.47$), whereas UAV in the loss-frame arm was significantly decreased (OR, 0.39; 95% CI, 0.26–0.59; $P = 0.0001$). These analyses are highly consistent with the individual-level analysis.

We conducted analyses for individual gain- and loss-frame clinics, although the reduced sample size diminished statistical power. In both loss-frame clinics a reduction in UAV at follow-up was found among those with multiple partners at baseline. Relative to attention-control clinics pooled, the odds were OR, 0.32 (95% CI, 0.14–0.71; $P = 0.005$) at one loss-frame clinic, and OR, 0.59 (95% CI, 0.25–1.41; $P = 0.24$) at the other loss-frame clinic. For the two gain-framed clinics, the odds were OR, 0.91 (95% CI, 0.29–2.87; $P = 0.87$) and OR, 0.76 (95% CI, 0.30–1.93; $P = 0.56$).

Our final analysis used imputed values of UAV to retain those lost to follow-up. We examined intervention effects for those with two or more partners at baseline after assuming no change in UAV (i.e., using the baseline score) in those lost to follow- up [28,29]. Using the full multivariate model we found that the reduction in UAV persisted (OR, 0.53; 95% CI, 0.26–1.06; $P = 0.07$) in the loss-frame arm compared to the control group.

Table 4. Generalized estimating equations[a] for unprotected anal or vaginal intercourse at time 2 by number of partners.

	Odds Ratio	95% Confidence interval	*P*
Overall[b]			
Attention-control	1.0		
Gain-frame	1.09	0.64–1.85	0.75
Loss-frame	0.70	0.40–1.24	0.22
One baseline sex partner[b]			
Attention-control	1.0		
Gain-frame	1.25	0.90–1.75	0.19
Loss-frame	1.13	0.83–1.54	0.44
Two or more baseline sex partners[b]			
Attention-control	1.0		
Gain-frame	1.19	0.73–1.94	0.50
Loss-frame	0.34	0.24–0.49	0.0001

[a]These models adjust for the effect of the clustering of patients by clinic. [b]Statistically controlling for the following variables at baseline: unprotected anal or vaginal intercourse, age, ethnicity, education, gender of sex partners, income, employment, years since testing HIV-positive, CD4 cell count, viral load, and being under treatment with antiretroviral therapy.

Discussion

This controlled intervention trial found that brief safer-sex counseling from primary care providers can be efficacious in reducing sexual behaviors that transmit HIV. HIV patients in medical care (estimated at 36–63% of adults with HIV infection in the USA) [30] may account for a significant fraction of HIV transmission. In spite of reduced infectivity of patients who are successfully treated with ART, [31,32] some patients fail treatment, [33] remain sexually active, [34] and potentially transmit HIV including drug resistant strains. Thus, widespread, sustained application of effective counseling could reduce HIV incidence in the USA where much of the HIV-infected population is under medical care.

The reduction of unsafe-sex in patients with initial risky profiles followed loss-, but not gain-framed interventions. There are solid conceptual grounds for explaining why the loss-frame intervention was efficacious. This may result from the differing immediacy and contingencies suggested by the two ways in which framing links risky behavior with outcomes. For patients engaged in risky behavior, the loss-frame message suggests 'your current behavior (unsafe-sex) could harm you or others' while the gain-frame message suggests 'changing your current behavior (switching to safer-sex) could protect you and others'. The loss-frame points out the potential serious consequences of the high-risk patient's current behavior, whereas the gain-frame addresses potential benefits of changed or idealized behavior. In addition, having HIV disease may predispose patients to think in terms of potential losses (e.g., 'I can get sicker,' 'I can infect others') thus enhancing their responsiveness to loss-framed messages [26]. Under conditions where patients have heightened concerns about their own health, loss-framed messages from a highly credible source such as one's health-care provider may strongly capture a patient's attention, increasing the extent to which the message is psychologically processed and acted upon. Whether combined gain- and loss-frame messages can change behavior as well is unclear.

The loss-frame intervention reduced unsafe sex in HIV patients with multiple or casual sex partners but not in

those with one partner at baseline. The latter participants had a much lower prevalence of UAV at intake, making it difficult for the interventions to reduce UAV further. Additionally, the intervention may have missed relationship-level factors (e.g., mutual discussion and agreement) necessary for behavioral change with steady partners. Counseling of couples may be needed to reduce sexual risk behavior in the context of a stable relationship [35]. Brief, loss-frame interventions may be most efficacious for patients who can change their behavior as an individual decision without need for discussion with a stable partner.

The failure of gain-frame interventions to change behavior could not be attributed to greater attrition or failure to deliver the intervention. However, smaller sample size (only 44 patients with multiple partners at baseline were available for follow-up in the gain-framed clinics) and pre-existing differences in their risky behavior (lower baseline prevalence of UAV at the gain-framed clinics) may have decreased the power to find an effect**.** Alternatively, emphasizing the positive consequences of safer behavior may not have had a strong psychological impact on those who are already HIV-infected. Additional research is necessary before conclusions can be reached about the efficacy of gain-framed messages in changing the sexual behaviors of HIV-positive persons.

These findings must be interpreted in the context of the limitations of the study. First, we cannot specify the source of the motivation for behavior change (self- or partner-protection, or both). Until this is clarified, counseling strategies should include both messages in order to address motivations that may vary across patients. Second, we cannot separate the contribution of written materials from the contribution of counseling from providers. Nevertheless, these components complement one another and are best conceptualized as an 'intervention package.' Third, because the intervention was evaluated with self-reports of sexual behavior biased reporting could have influenced the outcome, although our methodology attempted to minimize its effect. Moreover, our finding of an effect in only one of two arms strongly suggests that reporting bias was not a factor. Fourth, the loss-framed effect could depend on unique characteristics of the clinic or providers who delivered that intervention. This seems unlikely because reduction in UAV was observed in both loss-frame clinics. Although we do not know why the effect was somewhat larger in one clinic than the other, its consistency in two clinics is reassuring. Further, reductions in UAV were observed in the GEE model adjusting for clustering of patients by clinic. Finally, the reductions were observed only in participants with two or more partners at baseline (almost exclusively MSM). The small numbers of heterosexual men and women precluded separate analyses for these groups. Thus, our findings may apply only to behavioral change among MSM with multiple partners.

In summary, we have shown that counseling and messages that emphasize the risks or negative consequences of unsafe-sex can help reduce risky sexual behavior in HIV-positive patients with initially risky profiles. Brief provider-delivered safer-sex interventions are both feasible and effective at HIV clinics that serve a large number of patients. Additional research is needed to find ways to counsel those with one partner and, among those who are not currently sexually active, to maintain abstinence or safer sexual behavior in the future. Further refinement of interventions by tailoring the counseling to patient characteristics may also be beneficial.

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References

1. Wenger NS, Kusseling FS, Beck K, Shapiro MF. **Sexual behavior of individuals infected with the human immunodeficiency virus. The need for intervention.** *Arch Intern Med* 1994, **154**: 1849–1854.
2. Marks G, Burris S, Peterman TA. **Reducing sexual transmission of HIV from those who know they are infected: The need for personal and collective responsibility.** *AIDS* 1999, **13**:297–306.
3. Erbelding EJ, Stanton D, Quinn TC, Rompalo A. **Behavioral and biologic evidence of persistent high-risk behavior in an HIV primary care population.** *AIDS* 2000, **14**:297–301.
4. Simon PA, Thometz E, Bunch JG, Sorvillo F, Detels R, Kerndt PR. **Prevalence of unprotected sex among men with AIDS in Los Angeles County, California, 1995–1997.** *AIDS* 1999, **13**: 987–990.
5. Kalichman SC, Kelly JA, Rompa D. **Continued high-risk sex among HIV seropositive gay and bisexual men seeking HIV prevention services.** *Health Psychol* 1997, **16**:369–373.
6. Moreau-Gruet F, Jeannin A, Dubois-Arber F, Spencer B. **Management of the risk of HIV infection in male homosexual couples.** *AIDS* 2001, **115**:1025–1035.
7. Coates TJ, Morin SF, McKusick L. **Behavioral consequences of AIDS antibody testing among gay men.** *JAMA* 1987, **258**:1889.
8. Marks G, Ruiz MS, Richardson JL, Reed D, Mason HR, Sotelo M, *et al.* **Anal intercourse and disclosure of HIV infection among seropositive gay and bisexual men.** *J Acquir Immune Defic Syndr* 1994, **7**:866–869.
9. Posner SF, Marks G. **Prevalence of high-risk sex among HIV-positive gay and bisexual men: A longitudinal analysis.** *Am J Prev Med* 1996, **12**:472–477.
10. Vanable PA, Ostrow DG, McKirnan DJ, Taywaditep KJ, Hope BA. **Impact of combination therapies on HIV risk perceptions and sexual risk among HIV-positive and HIV-negative gay and bisexual men.** *Health Psychol* 2000, **19**:134–145.
11. Kline A, VanLandingham M. **HIV-Infected women and sexual risk reduction: The relevance of existing models of behavior change.** *AIDS Educ Prev* 1994, **6**:390–402.

12. Wilson TE, Massad LS, Riester KA, Barkan S, Richardson J, Young M, *et al.* **Sexual, contraceptive, and drug use behaviors of women with HIV and those at high risk for infection: results from the Women's Interagency HIV Study.** *AIDS* 1999, **13**: 591–598.
13. Kalichman SC. **Psychological and social correlates of high -risk sexual behaviour among men and women living with HIV/AIDS.** *AIDS Care* 1999, **11**:415–428.
14. DiClemente RF, Wingood GM. **A randomized controlled trial of an HIV sexual risk-reduction intervention for young African-American women.** *JAMA* 1995, **274**:1271–1276.
15. Kelly JA, St. Lawrence JS, Stevenson LY, Hauth AC, Kalichman SC, Diaz YE, *et al.* **Community AIDS/HIV risk reduction: The effect of endorsements by popular people in three cities.** *Am J Public Health* 1992, **82**:1483–1489.
16. Kelly JA, St Lawrence JS, Diaz YE, Stevenson LY, Hauth AC, Brasfield TL, *et al.* **HIV risk behavior reduction following intervention with key opinion leaders of population: An experimental analysis.** *Am J Public Health* 1991, **81**:168–171.
17. Kamb ML, Fishbein M, Douglas J, Rhodes F, Rogers J, Bolan G, *et al.* **Efficacy of risk-reduction counseling to prevent human immunodeficiency virus and sexually transmitted diseases: A randomized controlled trial.** *JAMA* 1998, **280**:1161–1167.
18. Kalichman SC, Rompa D, Cage M, DiFonzo K, Simpson D, Austin J, *et al.* **Effectiveness of an intervention to reduce HIV transmission risks in HIV-positive people.** *Am J Prev Med* 2001, **21**: 84–92.
19. Janssen RS, Holtgrave DR, Valdiserri RO, Shepherd M, Gayle HD, DeCock KM. **the serostatus approach to fighting the HIV epidemic: prevention strategies for infected individuals.** *Am J Public Health* 2001, **91**:1019–1024.
20. Silvestre AJ, Gehl MB, Encandela J, Schelzel G. **A participant observation study using actors at 30 publicly funded HIV counseling and testing sties in Pennsylvania.** *Am J Public Health* 2000, **90**:1096–1099.
21. Kottke TE, Battista RN, DeFriese GH, Brekke ML. **Attributes of successful smoking cessation interventions in medical practice: A meta-analysis of 39 controlled trials.** *JAMA* 1988, **259**: 2882–2889.
22. Fleming M, Barry K, Manwell L, Johnson K, London R. **Brief physician advice for problem alcohol drinkers: a randomized controlled trial in community-based primary care practices.** *JAMA* 1997, **277**:139–145.
23. Okene I, Hebert J, Ockene J, Merriam P, Hurley T, Saperia G. **Effect of training and structured office practice on physician-delivered nutrition counseling: The Worchester-area trial for counseling in hyperlipidemia.** *Am J Prev Med* 1996, **12**: 252–258.
24. Banks SM, Salovey P, Greener S, Rothman AJ, Moyer A, Beauvais J, *et al.* **The effects of message framing on mammography utilization.** *Health Psychol* 1995, **14**:178–184.
25. Meyerowitz BE, Chaiken S. **The effect of message framing on breast self-examination attitudes, intentions, and behavior.** *J Per Soc Psychol* 1987, **52**:500–510.
26. Rothman AJ, Salovey P. **Shaping perceptions to motivate healthy behavior: The role of message framing.** *Psychol Bulletin* 1997, **121**:3–19.
27. Detweiler, JB, Bedell BT, Salovey P, Pronin E, Rothman AJ. **Message framing and sunscreen use: gain-framed messages motivate beach-goers.** *Health Psychol* 1999, **18**:189–196.
28. Little RJA, Rubin DB. *Statistical analysis with Missing Data.* New York: John Wiley, 1987.
29. Schafer JL. *Analysis of incomplete Multivariate Data by Simulation.* New York: Chapman and Hall; 1996.
30. Bozzette SA, Berry SH, Duan N, Frankel MR, Leibowitz AA, Lefkowitz D, *et al.* **The care of HIV-infected adults in the United States. HIV Cost and Services Utilization Study Consortium.** *N Engl J Med* 1998, **339**:1897–1904.
31. Quinn TC, Wawer MJ, Sewankambo D, Serwadda D, Li C, Wabwire-Mangen F, *et al.* **Viral load and heterosexual transmission of human immunodeficiency virus type 1. Rakai Project Study Group.** *N Engl J Med* 2000, **342**:921–929.
32. Vernazza PL, Troiani L, Flepp MJ, Cone RW, Schock J, Roth F, *et al.* **Potent antiretroviral treatment of HIV-infection results in suppression of the seminal shedding of HIV.** *AIDS* 2000, **14**:117–121.
33. Wit FW, van Leeuwen R, Weverling GJ, Jurriaans S, Nauta K, Steingrover R, *et al.* **Outcome and predictors of failure of highly active antiretroviral therapy: one-year follow-up of a cohort of human immunodeficiency virus type 1-infected persons.** *J Infec Dis* 1999, **179**:790–798.
34. Colfax GN, Buchbinder SP, Cornelisse PGA, Vittinghoff E, Mayer K, Celum C. **Sexual risk behaviors and implications for secondary HIV transmission during and after HIV seroconversion.** *AIDS* 2002, **16**:1529–1535.
35. van der Straten A, Knight VK, Gomez C, Padian N. **Managing HIV among serodiscordant heterosexual couples: serostatus, stigma and sex.** *AIDS Care* 1998, **10**:533–548.